XI.3 Oil-Free Hydrogen Compressor (Phase I Project)

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Cost effective compression technology has been identified by DOE as one of the critical elements needed for effective pipeline delivery of hydrogen gas for both vehicular transportation and distributed electricity generation with fuel cells. Current hydrogen compression technology is plagued by poor reliability, poor durability, poor efficiency, and high cost. These current technologies also use oil lubrication, which poses contamination problems for fuel cells. This project will develop an oil-free, high speed centrifugal compressor that addresses the limitations in current technology. Tribologically engineered coatings will be applied to oil-free compliant foil bearings and seals. Combined with advanced high-speed drives and centrifugal compressors, this approach will offer the best solution to overcoming the current compression system limitations. In Phase I, trade-off, sizing, and configuration studies will be conducted to identify the critical technologies and components needed to develop high performance oil-free hydrogen compressors. Key tribological coatings and hydrogen testing requirements for the compressor components will be identified, and plans will be prepared for Phase II testing.